Additions to the Genus *Pseudopiptocarpha* (Asteraceae, Vernonieae) from Northern South America

Harold Robinson
Department of Botany, National Museum of Natural History, MRC-166, P.O. Box 37012, Smithsonian Institution, Washington, D.C. 20013-7012, U.S.A. robinsoh@si.edu

Sterling C. Keeley
Department of Botany, University of Hawaii, Manoa, 3190 Maile Way, #101, Honolulu, Hawaii, 96822-2279, U.S.A. sterling@hawaii.edu

Abstract. *Pseudopiptocarpha garcia-barrigae* H. Robinson & S. C. Keeley is described as new, and *P. tovarensis* (Gleason) H. Robinson & S. C. Keeley of Venezuela (Asteraceae, Vernonieae) is transferred from *Lepidaploa* (Cassini) Cassini. The new species and *P. tovarensis* have branching inflorescences unlike the two previously known members of *Pseudopiptocarpha* H. Robinson. All four species of *Pseudopiptocarpha* have *Aynia* H. Robinson–type pollen, which does not occur in *Lepidaploa* as redelimited.

Resumen. Se describe *Pseudopiptocarpha garcia-barrigae* H. Robinson & S. C. Keeley como una nueva especie y se transfiere *P. tovarensis* (Gleason) H. Robinson & S. C. Keeley (Asteraceae, Vernonieae) desde *Lepidaploa* (Cassini) Cassini. Ambas especies tienen inflorescencias ramificadas, a diferencia de las que presentan las otras dos especies conocidas para el género *Pseudopiptocarpha* H. Robinson. Las cuatro especies de *Pseudopiptocarpha* tienen polen tipo *Aynia* H. Robinson, el cual no se encuentra en *Lepidaploa* de acuerdo a su nueva circunscripción.

Key words: Asteraceae, Colombia, *Lepidaploa*, *Pseudopiptocarpha*, Venezuela, Vernonieae.

The genus *Pseudopiptocarpha* H. Robinson (Asteraceae, Vernonieae) was described in 1994 for two Colombian species that were previously placed in *Vernonia* Schreber and *Piptocarpha* R. Brown (Robinson, 1994). The two species, *P. elaeagnoides* (Kunth) H. Robinson and *P. schultzii* (H. Karsten ex Schultz-Bipontius) H. Robinson, had long-armed T-shaped trichomes, spiciform inflorescences with heads sessile in axillary clusters, somewhat deciduous inner involucral bracts, short raphids in the achene walls, and a distinctive *Aynia* H. Robinson–type pollen. The two species differed from the related *Lepidaploa* (Cassini) Cassini, which had a branching inflorescence, persistent inner involucral bracts, and elongate raphids in the achene. The two species initially placed in *Pseudopiptocarpha* differed further from most of *Lepidaploa* by the T-shaped trichomes and the specialized pollen. Examination of new collections now leads to a partial emendation of the concept of *Pseudopiptocarpha*.

Among the many collections of the junior author in 1983 and 1984 in northern South America was material initially determined as *Lepidaploa tovarensis* (Gleason) H. Robinson. The species was particularly noted because of its *Aynia*-type pollen, a feature cited by Robinson (1990) in a review of *Lepidaploa* and again at the time of the description of *Pseudopiptocarpha*. At the time of the earlier citations, the significance of the pollen was not fully appreciated. The transfer of *L. tovarensis* from *Lepidaploa* and the description of the related Colombian species result in a concept of *Pseudopiptocarpha* more consistently defined by its pollen.

The *Aynia*-type pollen found in *Pseudopiptocarpha* (Figs. 1, 2) is characterized as tricolporate, echinolophate, with a triplet of lacunae at the poles aligned with the intercolpi rather than the colpi, and with abutting, but incompletely fused, cross-walls in the short colpi above and below the pores. Although not seen with the SEM in the two species described and transferred here, the 40× lens of the compound microscope shows evidence of well-developed, free-standing bacculae, a feature seen in typical *Pseudopiptocarpha*, but not in *Lepidaploa*.

In the Vernonieae, the *Aynia*-type pollen is characteristic of the genera *Aynia*, *Harleya* S. F. Blake, and *Pseudopiptocarpha*. It is not found in *Lepidaploa* as redelimited. Species remaining in *Lepidaploa* have primarily type C grains with a single polar areole or have colpi meeting at the poles.

In the present study, characters in the following order were seen to demonstrate the relationship of *Lepidaploa tovarensis* and the new species to *Pseudopiptocarpha*: the pollen, the T-shaped trichomes on the

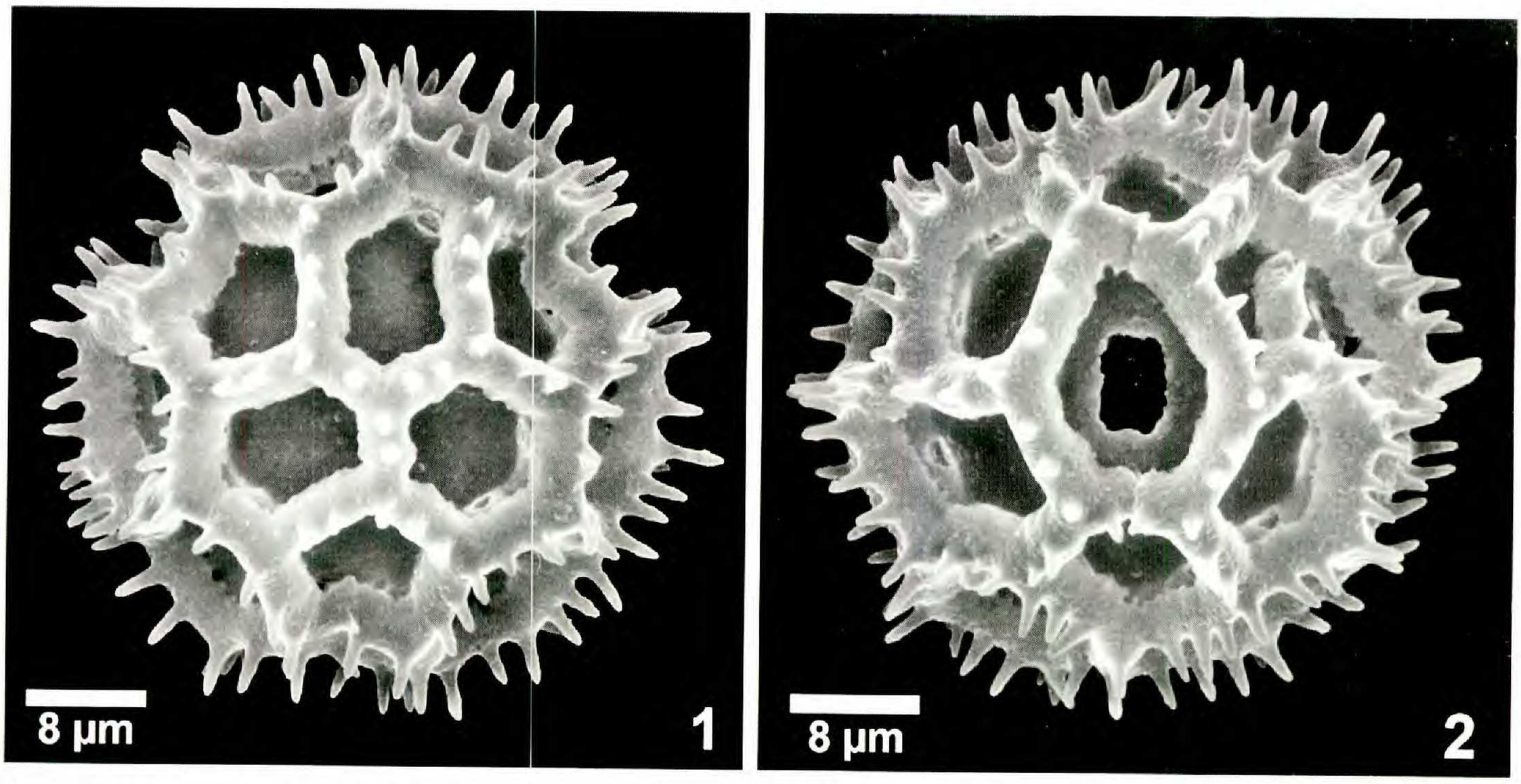

Figure 1, 2. Pollen of *Pseudopiptocarpha tovarensis* (Gleason) H. Robinson & S. C. Keeley. —1. Polar view, showing triplet of lacunae aligned with intercolpi. —2. Colpar view, showing the short colpus not reaching the poles and showing incompletely fused crosswalls above and below pore.

leaf undersurfaces, the tendency for the main axis of the inflorescence to have only axillary clusters of heads, and the tendency of the inner involucral bracts to be deciduous. Raphids seem to be lost or obscured in mature achenes of *P. tovarensis* (Gleason) H. Robinson & S. C. Keeley and the new species, but they were found in a young achene of the new species, and they were short and subquadrate, as in typical *Pseudopiptocarpha*, unlike the elongate form in *Lepidaploa*. Heads clustered at each node are characteristic of all four species of *Pseudopiptocarpha*, differing from the one or two heads at a node in most *Lepidaploa*.

The two additions to *Pseudopiptocarpha* are as follows.

Pseudopiptocarpha garcia-barrigae H. Robinson & S. C. Keeley, sp. nov. TYPE: Colombia. Santander del Norte: carretera de Abrego a La María (Enclave seco); yerba de tallos largos de unos 2 m, inflorescencia de color lila, 1500–2500 m, 22–23 May 1969, *M. García-Barriga & R. Jaramillo Mejía 19914* (holotype, US; isotype, COL not seen). Figure 3.

Haec species *Pseudopiptocarphae tovarensi* (Gleason) H. Robinson & S. C. Keeley in inflorescentiis ramosis et in pilis T-formibus stipitibus elongatis similis sed in foliis ellipticis et denticulatis in bracteis involucri obtusis et tomentellis et in ramis inflorescentiarum numerosis et ascendentibus differt.

Subshrubs ca. 2 m tall, apparently unbranched below inflorescence; stems terete, faintly striate, loosely tomentose with T-shaped trichomes. Leaves alternate, petioles 0.5–1.5 cm; blades elliptical, 12 × 4 cm wide or wider in lower leaves, reduced to 2.5 × 1.2 cm on main axis of inflorescence, with 7 to 9 pairs of secondary veins ascending from costae at ca. 45° angles, bases of blades obtuse, margins denticulate to subentire, slightly recurved, apex short-acute, upper surface densely pilosulous, lower surface loosely grayish tomentose with long-stalked T-shaped trichomes, with cap-cells not aligned. Inflorescence rather columnar, with 2 to 6 sessile heads in lower leaf axils, in upper part with long, ascending, seriate-cymose branches bearing small bracteoles and clusters of sessile or nearly sessile heads at each node. Heads campanulate, 6–7 mm high; involucres ca. 4 × 4 mm, bracts ca. 30 to 35 in ca. 4 series, broadly ovate to oblong-elliptical, 1–4 × 1–1.5 mm, apex obtuse with abrupt sharp apiculus, outside glabrous at base, obscured by dense grayish tomentum distally; receptacle glabrous, alveolate. Flowers 10 to 13 in a head; corollas lilac, ca. 5.5 mm, with scattered glands outside, especially on throat and distally on lobes, few nonglandular trichomes at tips of lobes, basal tube ca. 2.5 mm, throat ca. 1 mm, lobes ca. 2 mm; anther thecae ca. 1.6 mm, spurs ca. 0.8 mm long, apical appendage of anther oblong-ovate, ca. 0.7 × 0.2 mm, with firm-walled cells; style base with annular ring; style branches with acute,

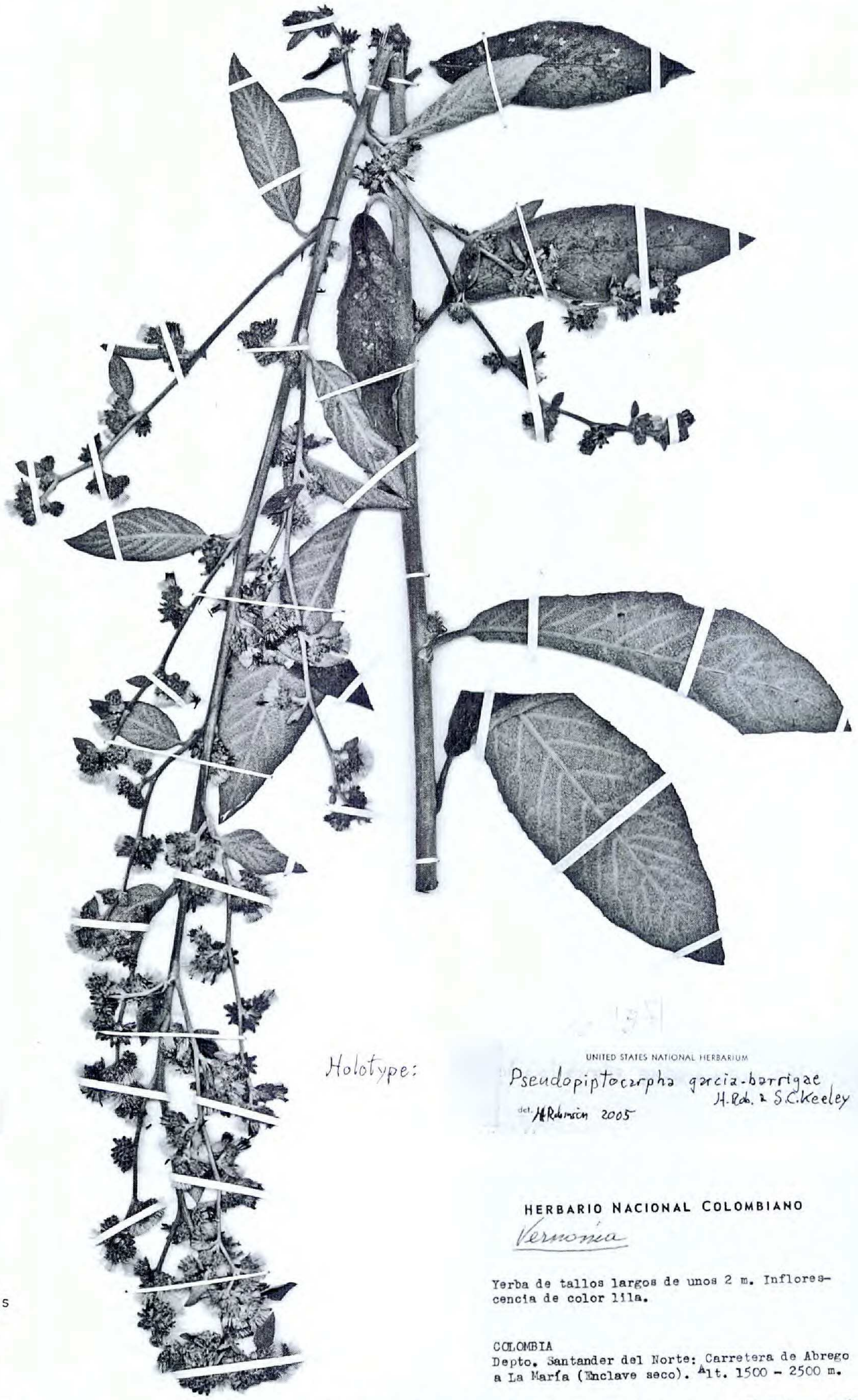

Figure 3. *Pseudopiptocarpha garcia-barrigae* H. Robinson & S. C. Keeley, holotype (US).

sweeping hairs. Achenes cylindrical, 2–2.5 mm, 10-costate, with scattered glandular dots and erect-spreading setulae, short subquadrate raphids seen in young achene; pappus white, outer series of narrow scales ca. 0.5 mm, inner series of 50 to 60 capillary bristles very slender and fragile at base, broader distally. Pollen grains ca. 47 µm diam., echinolophate, *Aynia*-type, with triplet of lacunae

at poles aligned with intercolpi and with medially sutured lophae in the colpi above and below the pores.

Pseudopiptocarpha garcia-barrigae is known only from the type collected in 1969. It is rather fortuitous that the specimen was pulled out of the *Lepidaploa* indet. folder at the time when the new collection of *P. tovarensis* was being studied in 2003. The two species are unquestionably related, sharing the T-shaped trichomes with long, multiseptate stalks and the *Aynia*-type pollen. The cap-cells on the trichomes are more slender in the new species, but in *P. tovarensis* the cap-cells vary from having both ends extended to having one end short. Long-armed T-shaped trichomes are characteristic of typical *Pseudopiptocarpha*, although in the latter the trichomes have shorter stalks, have the cap-cells aligned, and are closely appressed to the stem and leaf surfaces. Such trichomes are in contrast to the more simple forms of trichomes found in most Andean, West Indian, and Central American species of *Lepidaploa*, but well-developed T-shaped trichomes are common in some *Lepidaploa* species, mostly of Brazil (e.g., *L. cotoneaster* (Willdenow ex Sprengel) H. Robinson, *L. rufogrisea* (A. Saint-Hilaire) H. Robinson, and their relatives).

The new species contrasts with *Pseudopiptocarpha tovarensis* by having elliptical rather than oblong-ovate leaves, a more columnar inflorescence with longer, more ascending branches, and much broader, more obtuse, and densely tomentose involucral bracts.

Pseudopiptocarpha tovarensis (Gleason) H. Robinson & S. C. Keeley, comb. nov. Basionym: *Vernonia tovarensis* Gleason, Amer. J. Bot. 19: 753. 1932. *Lepidaploa tovarensis* (Gleason) H. Robinson, Proc. Biol. Soc. Washington 103: 495. 1990. TYPE: Venezuela. Merida: on bushy slopes near Tovar, 1200 m, 31 Jan. 1928, *H. Pittier 12794* (holotype, NY; isotype, US).

The additional specimen, *S. C. Keeley & J. E. Keeley 4480*, agrees closely with the type of Gleason (1932) and with the descriptive information in Badillo (1989), but both the type and the new collection show some details not mentioned in previous descriptions of the species. The trichomes of the stems and lower leaf surfaces form a loose tomentum, with individual trichomes T-shaped and long-stalked. The stalks are multiseptate, and the cap-cells are oriented in all directions with no tendency to appear sericeous. The single cap-cells are long, mounted nearer one end in the type specimen, but extended at both ends and broadened and rather triangular at the juncture with the trichome stalk in the new collection.

The inflorescence in *Pseudopiptocarpha tovarensis* is consistent in form, starting below with clusters of sessile heads in axils of lower foliose bracts, then expanding with branches into a pyramidally thyrsiform shape above. The individual branches appear as seriate cymes with small foliose bracteoles and 2 or 3 or more heads at each node, a pattern also found in some *Lepidaploa*. The involucral bracts are 25 to 30 in ca. 4 series, narrowly ovate to narrowly oblong, 1–4 × 0.5–1 mm. The bract apices are apiculate to shortly aristate, with the arista longer in lower bracts. The bract outer surface is yellowish brown, with a greenish, pilosulous and glanduliferous patch distally near the apex. The innermost bracts are somewhat deciduous, which contrasts with the highly persistent inner bracts of *Lepidaploa*. The receptacle is glabrous, alveolate. Flowers are 6 to 11 in a head. The corollas are without non-glandular trichomes. They have scattered glands below and are densely glanduliferous distally on the lobes.

The spiciform base of the inflorescence in *Pseudopiptocarpha tovarensis* is very similar to that of typical *Pseudopiptocarpha*, but the inflorescence in the original two Colombian species of the genus remains unbranched and spiciform throughout with only axillary clusters of heads.

On the collection label, the question was raised whether the plant was a hybrid. This seems doubtful, but if so, it is one that has persisted in the Tovar area for at least 80 years. Nevertheless, hybridization undoubtedly occurs in many Vernonieae.

Additional specimen examined. VENEZUELA. **Merida:** 4.5 km from Guaraque, on road from Tovar to Canagua, 2.8 km from turnoff to Las Vegas, *S. C. Keeley & J. E. Keeley 4480* (MO, US).

Other specimens seen in the collection at US under the species name are not *Pseudopiptoarpha tovarensis*.

Key to the Four Species of *Pseudopiptocarpha*

1a. Inflorescence spiciform, with all heads clustered in axils of primary leaves; leaf blades subcoriaceous, with upper surface sparsely puberulous and obviously gland-dotted, lower surface sericeous with appressed T-shaped trichomes.
  2a. Leaf blades linear to narrowly lanceolate, 0.6–2 cm wide; secondary veins short, spreading at only 35°–45° angles, arched from near midvein; basal involucral bracts often obscured by pubescence; pappus usually reddish in color . . . . . *P. elaeagnoides* (Kunth) H. Robinson
  2b. Leaf blades elliptical to obovate, 2.3–9.3 cm wide; secondary veins elongate, spreading at 45°–55° angles, straight near midvein; involucral bracts not totally obscured by pubescence; pappus bristles whitish or slight-

ly sordid . . . . . *P. schultzii*
(H. Karsten ex Schultz-Bipontius) H. Robinson

1b. Inflorescence with branches in middle or distal part; leaf blades herbaceous, with upper surface densely pilosulous, lower surface loosely tomentose with long-stalked T-shaped trichomes.
3a. Leaf blades elliptical, widest near middle; inflorescence rather columnar with ascending branches in upper part; involucral bracts broadly ovate to oblong-elliptical with apices obtuse, distally bearing dense grayish tomentum . . . . . *P. garcia-barrigae* H. Robinson & S. C. Keeley
3b. Leaf blades oblong-ovate, widest below middle; inflorescence thrysiform and pyramidal with spreading branches in middle or upper part; involucral bracts narrowly ovate to narrowly oblong, with short-apiculate to aristate apices, with a pilosulous and glanduliferous greenish subapical patch . . . . . *P. tovarensis* (Gleason) H. Robinson & S. C. Keeley

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Literature Cited

Badillo, V. M. 1989. Enumeración de las Vernonieae (Compositae) de Venezuela. Ernstia 54: 1–27, figs. 1–24.

Gleason, H. A. 1932. Some undescribed flowering plants from South America. Amer. J. Bot. 19: 740–754.

Robinson, H. 1990. Studies in the *Lepidaploa* complex (Vernonieae: Asteraceae). VII. The genus *Lepidaploa*. Proc. Biol. Soc. Washington 103: 464–498.

———. 1994. *Cololobus*, *Pseudopiptocarpha*, and *Trepadonia*, three new genera from South America (Vernonieae: Asteraceae). Proc. Biol. Soc. Washington 107: 557–568.